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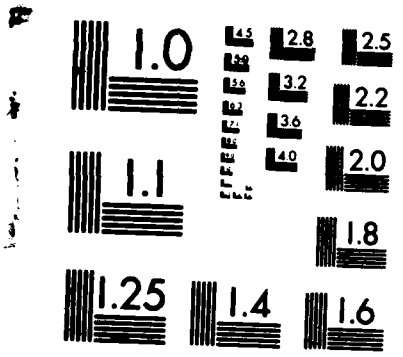

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X-RAY ABSORPTION SPECTROSCOPY OF GAS PHASE METAL CLUSTERS

by

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X-RAY ABSORPTION SPECTROSCOPY OF GAS PHASE METAL CLUSTERS

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Catalysis[1] and transition metal coordination chemistry, specifically metal-halide ligand formation[2], are long standing research interests of ours. Another active topic of applied research, to which we have recently become associated, is the production and control of vapor phase metal clusters in sizes ranging from one to thousands of atoms[3]. Also, we have established that electron yield detection has a very high sensitivity to species in the gas phase[4]. These events suggested the possibility of a combined experiment; in-situ x-ray absorption study of evaporated metal in gas phase. The comparison of gas phase results to earlier work on supported metal catalysis would be very helpful in determining the extent of support interaction. In addition, new information gathered from experiments where gas phase metal atoms or clusters are reacted with molecules, such as H_2O, Cl, NH_3 etc., would improve our understanding of transition metal coordination chemistry.

Trial experiments were completed at SSRL using a preliminary design for the metal vapor cell/detector. A resistance heated evaporation source was positioned so that metal vapor (in this case Cu) would flow directly through the electron detection grids, while the x-ray beam crossed through the vapor between the grids. Our results suggested some improvements to the evaporator design which would result in better electrical isolation and less contamination of insulators. The newer design will also have better vacuum pumping characteristics and a longer path for x-rays through the vapor.

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